

**IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF MONTANA  
GREAT FALLS DIVISION**

ENVIRONMENTAL DEFENSE FUND;  
MONTANA ENVIRONMENTAL  
INFORMATION CENTER; and CITIZENS  
FOR CLEAN ENERGY,

*Plaintiffs,*

v.

U.S. ENVIRONMENTAL PROTECTION  
AGENCY; and ANDREW R. WHEELER, in  
his official capacity as Administrator of  
the U.S. Environmental Protection  
Agency,

*Defendants.*

Case No.: 4:21-cv-00003-BMM-JTJ

The Honorable Brian Morris,  
Chief Judge

**DECLARATION OF DR. JOHN R. BALMES**

I, John R. Balmes, M.D., do declare and state as follows:

1. I am a Professor of Medicine at the University of California, San Francisco (UCSF), where I have been on the faculty since 1986; and since 2002, also a Professor of Environmental Health Sciences at the School of Public Health of the University of California, Berkeley (UC Berkeley). I am an Attending Physician in Pulmonary and Critical Care Medicine and in Occupational and Environmental Medicine at the Zuckerberg San Francisco General Hospital. I received my M.D.

from Mount Sinai School of Medicine. A copy of my National Institutes of Health biographical sketch is appended to and included as part of this declaration.

2. For over 40 years I have been studying the effects of exposure to various occupational and environmental agents on respiratory, cardiovascular, and metabolic health. My current primary areas of research interest are occupational and environmental respiratory disease, the effects of exposures to various air pollutants on respiratory and cardiovascular health, exposure-response relationships, and air pollution contributions to the metabolic syndrome. Of specific interest, I am one of the multiple principal investigators of a Children's Environmental Health Center grant through the National Institute of Environmental Health Sciences (NIEHS)/Environmental Protection Agency (EPA) to study the adverse effects of air pollution on children living in Fresno, in the San Joaquin Valley. Among the peer-reviewed studies published from that effort, is John R. Balmes, *et al.*, *Polycyclic aromatic hydrocarbon exposure and wheeze in a cohort of children with asthma in Fresno, CA*, 22 J. Expo Sci. & Environ. Epidemiol. 386 (July 2012). I am currently the contact principal investigator of an NIEHS R24 Environmental Epidemiology Cohort Maintenance grant to update and continue following the Fresno cohorts.

3. In addition to my medical professional work, I also serve as the Director of the Northern California Center for Occupational and Environmental Health. I serve on the Editorial Board and as Associate Editor of the *American Journal of*

*Respiratory and Critical Care Medicine.* I am affiliated with several professional organizations, among them the American Thoracic Society (ATS), of which I have been an active member since 1980, participating on a number of committees, including four years of service on the ATS Board of Directors. This past year, I received the ATS Distinguished Achievement Award.

4. I am the Physician Member of the California Air Resources Board. I also actively advise other governmental agencies at the local, state, and national levels regarding air pollution health effects, climate change health effects, and occupational health. That work is important to me personally, and it is also important to me that my research is useful in public policy decision-making, as it has been on multiple occasions. For example, some of my research was relied on in setting the National Ambient Air Quality Standards for Ozone, in 2015. *See* 80 Fed. Reg. 65,292, 65,449 (Oct. 26, 2015).

5. I was a member of the EPA Clean Air Scientific Advisory Committee Particulate Matter Review Panel that was formed in 2015 to augment the expertise of the Clean Air Scientific Advisory Committee and support its 2015-2020 review of the National Ambient Air Quality Standards for particulate matter. While our Panel was dismissed by press release in October 2018, right before the draft science assessment for the most recent review of the particulate matter standards was released by the Agency, I and the other members of the Panel formed the

nongovernmental Independent Particulate Matter Review Panel, and continued as citizen volunteers, to review the science and provide advice in the record for the EPA Administrator.

6. I am currently, and for many years have been, a member of the Environmental Defense Fund as I strongly believe and support its mission to advocate for science-informed policy and decision-making. I provide this declaration in support of efforts by the Environmental Defense Fund to halt U.S. EPA's attempt to limit the science the Agency can rely on in making decisions concerning the public health effects of pollution exposures.

7. Physicians and scientists undertake environmental epidemiology studies of the kind I lead and collaborate on by systematically following, over time, groups of people (cohorts) with similar characteristics and/or exposures to environmental pollution. Using data from a cohort, scientists can investigate not only the original research question, but also new research questions. Creating and maintaining a research cohort, and obtaining approval for it and for the work to be done with it, is a significant investment of intellectual capital, time, and commitment for members of the research community. At the most fundamental level, creating a human health study cohort requires the identification of persons willing to participate in our research, and securing their agreement to offer their personal health and other information to us.

8. For any study using data from a cohort, I and my colleagues on a study must obtain Institutional Review Board (IRB) approvals from our institutions prior to embarking on the study. The IRBs at both UCSF and UC Berkeley have very strict rules regarding confidentiality of research data collected through human health studies, especially for any personally identifiable information. Considerable investigator and staff effort is required to develop the confidentiality component of a study protocol that meets IRB approval. Any data sharing outside of the study investigative team must also involve IRB approval and data sharing outside of the institution requires a formal agreement. When such an agreement is signed, it almost always excludes personally identifiable information. Considerable investigator and staff effort is required to develop and manage a data sharing agreement.

9. The nature of my own public health research therefore requires that I collect sensitive personal information from study participants, and enter into contractual agreements with them (or in the case of children, with their parents/families), guaranteeing its confidentiality. The specific kinds of information I collect from members of a study cohort can include very sensitive, personal, and identifiable data and information, such as biological information about individuals, including blood, urine, saliva, hair and nail samples; lung function measurements; height and weight; and other biometrics. I also collect geographic and geospatial data about where participants live, including their exact residential addresses and

where they go; I often have almost continuous measurement of their locations throughout a study. And I collect sensitive personal information such as socioeconomic status, race, and income. For example, in the Fresno children's health study I reference above, and another of my current study cohorts as well, the majority of the participants are Latinx, and in some cases are undocumented residents. Their undocumented status is an important characteristic for the study (for example, one of my study research questions involves the relationship between psychosocial stress of undocumented status and adverse outcomes from air pollution exposures). While study participants typically agree that the results of the study can be made public, including information in the aggregate, I agree with them that I will not disclose any information that could lead to them being personally identified as part of the study cohort.

10. Given the sensitive nature of this information, in my experience, it is unlikely that individuals would agree to participate in a study in which I could not guarantee this degree of confidentiality. The ability to maintain the confidentiality of participants' information is therefore necessary to securing their participation in the study. Being able to provide that assurance is also important to me because the institutions I am affiliated with, the University of California at San Francisco and the University of California at Berkeley, require complete confidentiality as a condition of their IRB approval of my research work, as noted above.

11. Because some of my current work involves health effects in children living in a particular environment, I also must continually recruit study participants as the members of the cohort “drop out” over time. To do this, I work with the children and their families to establish their trust and to enter agreements to ensure the confidentiality of their data.

12. One important reason cohort members want to participate in the work we do, and agree to share their personal health and other information with us, is that they hope to have a positive impact and help make change—to be a part of work that can improve the environmental conditions where they live and work. And that is also why I do the research I do—it is in part for use by the government, at all levels, in setting air quality and other environmental standards, to improve the lives of all of us.

13. I am aware that the EPA proposed in 2018, and again in 2020, a rule that was announced by the EPA Administrator on January 5, 2021, and which states that the EPA cannot give full (or “great”) consideration to dose-response studies, which it defines to include the kinds of human cohort-based public health studies of pollutant exposure I do, to support important public policies and significant regulatory actions unless the public at large has access to the cohort data and models underlying the study. *See* 86 Fed. Reg. 469, 470, 492 (Jan. 6, 2021). The EPA also suggests that a restricted form of access to the data and models—to allow others who

are not involved in the initial creation of the study to exactly reanalyze the same data—may be sufficient to allow the EPA to continue using peer-reviewed published dose-response research results. Furthermore, I understand that EPA has declared the Rule to be effective immediately on publication in the Federal Register, which I understand occurred on January 6, 2021.

14. In effect, this Rule severely restricts EPA from considering many vital public health studies that are based on confidential personal information that cannot be legally or ethically disclosed, including the work I am currently doing. Unless I disclose the data and information, EPA may not afford my work full weight in informing its policy choices or regulations.

15. Both I and my work are immediately harmed by the Rule. I am right now in the process of actively recruiting additional cohort members for the recently funded additional work on our Fresno study discussed above. It is important to me—and to many of my study participants—that my work be able to serve as pivotal science and receive the highest possible weight at all levels of EPA decision-making. In order to ensure this remains possible given the new requirements in the Rule, I will immediately need to inform potential study members and their families either that the research results will receive reduced weight and be less likely to impact EPA decision-making that could improve conditions for them, or that if it is to receive full weight, I cannot guarantee that their personal information will remain confidential.

As discussed below, either course will mean that it will be difficult for me to recruit enough participants for my study and will have to expend significantly more resources attempting to do so.

16. For one thing, it will not be an option to de-identify the data on which my study is based. While there are in theory methods to “de-identify” data, as EPA says in the Rule could be done to allow access to the public to reproduce my study results, because of the geographic focus of my work, and the characteristics of the cohort members, it actually will be almost impossible to maintain their confidentiality even under the protocols the Rule assumes can be used. In fact, this is a problem for most such environmental health research. Several peer-reviewed studies have shown that, particularly for the kinds of cohort data I work with—specifically, data containing specific geographic identifiers—data can be traced back to a particular individual, even where data are released under so-called “restricted access in a manner sufficient for independent validation” as referred to by the Rule. Sweeney, *et al.*, have published such work, for example. L. Sweeney, et al., *Re-identification Risks in HIPAA Safe Harbor Data: A Study of Data from One Environmental Health Study*, Tech. Sci., August 28, 2017, available at <http://techscience.org/a/2017082801>. In this era of “big data,” it is too easy for large institutions such as the government to cross-reference data from multiple sources to make the connections necessary to associate the results of my studies with the individual participants. Once data are

made public, even in this form, they cannot be recalled or controlled, and I cannot provide the assurances of confidentiality necessary to recruit participants.

17. This means that the work I am now in the midst of doing is immediately compromised by the Rule. Because of the Rule, I am immediately going to be limited in my ability to recruit new study participants, and unlikely to be able to recruit participants who are not documented, as I will need to disclose to them the likelihood that their information may be made public if the government relies on the results of my research. If I inform eligible individuals (and their families) that I cannot guarantee their confidentiality, they will not agree to participate in my study—especially if they are undocumented. As I noted earlier, my current research with the Fresno study cohort actually includes many undocumented cohort members, and the question of maintaining confidentiality from the government is of even more heightened concern to those individuals. And if, instead, I inform potential participants that the study will receive diminished weight in any EPA decision-making, they will be less likely to participate because they will see less value to the work.

18. To be clear—the problem is deeper than preserving personal identifiers and confidential personal information. In my experience, trust is essential to obtaining consent from individuals to participate in studies—especially among members of historically oppressed or disenfranchised communities, such as Latinx

community members and undocumented residents, many of whom are understandably wary about how information about them is used. Building that trust takes years of work and a proven history of meeting commitments. And it is delicate. Having to now go back to members of an existing cohort and tell them that the status and usefulness to the EPA of the research they participated in has changed, and/or that their personal information is at risk of being made public, immediately destroys that trust.

19. This means that the study that has been funded, and the researchers whose jobs depend in part on working on that study, are immediately compromised by the Rule. If we cannot replenish our study cohorts with sufficient numbers of new participants, we are in danger of losing our funding on which multiple jobs depend. We indicated in our successful R24 grant application for NIEHS funding that we had ~400 total participants in our Fresno study cohorts. That number of participants was criticized during the application review process as being small in size. If we lose more than 100 participants, NIEHS could consider our study population too small to merit continued funding. This means risks to nearly a dozen jobs: the Fresno children's study which I reference currently employs six faculty and staff at UCB and five staff at our field site at the Central California Asthma Collaborative.

20. The Rule also will adversely affect my work as a professor by discouraging me, my faculty colleagues, and students from engaging in this public

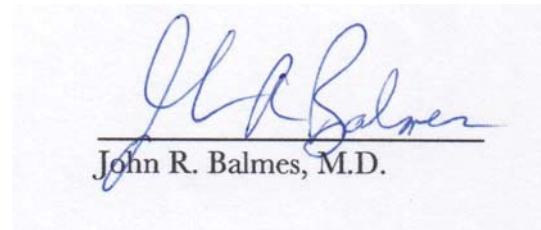
health research. To put a fine point on it, because the epidemiological studies I and my colleagues have built our careers on have just become less impactful in public policy decision-making, less likely to receive funding from federal and other agencies, and less interesting to the scientific community in general, students are less likely to want to pursue it. That also will mean that I—and other researchers across the country who do this work—will have a harder time securing funding to conduct air pollution epidemiological studies and attracting the best and brightest students to work in this important area of public health research. The best and brightest students and junior faculty will turn away from conducting air pollution epidemiological work and pursue other types of studies.

21. I also am deeply opposed to the Rule because it imposes artificial limitations on access to scientific information and how that information may be used. The validity of epidemiological studies does not depend on reviewing or having access to the underlying data, including confidential personal information of study participants. The Rule will not promote better decision-making or a better understanding of the environmental and health issues at stake. To the contrary, the Rule will limit decision-makers from being able to use the most valuable source of scientific information about the health effects of exposure to environmental toxicants: results of analyses of data from the individuals who actually are or have been exposed. With reduced access to that information, EPA decision-makers will

simply not be able to make fully informed decisions to protect the health and safety of at-risk populations.

I declare under the penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2021



The image shows a handwritten signature in blue ink, which appears to be "John R. Balmes". Below the signature, the name "John R. Balmes, M.D." is printed in a smaller, black, sans-serif font.

# Exhibit A

## BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.  
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Balmes, John R., MD

ERA COMMONS USER NAME (credential, e.g., agency login): BALMES

POSITION TITLE: Professor, University of California, Berkeley and San Francisco

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	Completion Date MM/YYYY	FIELD OF STUDY
University of Illinois	BA	06/1972	Psychology
Mount Sinai School of Medicine	MD	06/1976	Medicine
Mount Sinai Medical Center, NYC	Residency	06/1979	Internal Medicine
Yale University	Post-doctoral fellowship	06/1981	Pulmonary Medicine

### A. Personal Statement

I am a physician-scientist who has been studying adverse health effects of air pollutants and other environmental toxins for over 40 years. I have investigated impacts of exposures to environmental agents on adults and children in both controlled human exposure and epidemiological studies. In my laboratory at the University of California, San Francisco, I have studied the acute effects of exposure to ozone, SO<sub>2</sub>, NO<sub>2</sub>, and particulate matter on lung function and airway inflammation in adults with asthma as well as cardiovascular effects of exposure to secondhand tobacco smoke and ozone. In Fresno, CA, I have studied the associations between air pollution and respiratory symptoms, lung function, and immune dysfunction in children with and without asthma. I was one of three multiple PIs leading a NIEHS/EPA-funded Children's Environmental Health Center (the Children's Health and Air Pollution Study or CHAPS); my project for CHAPS involved studying associations of exposure to air pollution with metabolic outcomes. Currently, I am the contact PI for an R24-funded 5-year extension of CHAPS. I have also participated in multiple studies of longitudinal change in lung function, several of which are noted below. I have a long-time collaborative relationship with both Drs. English and Solomon.

1. Pope D, Diaz E, Smith-Sivertsen T, Lie RT, Bakke P, **Balmes JR**, Smith KR, Bruce NG. Exposure to household air pollution from wood combustion and association with respiratory symptoms and lung function in nonsmoking women: results from the RESPIRE trial, Guatemala. Environ Health Perspect. 2015 Apr;123(4):285-92. PMCID: PMC4384202
2. Rylance S, Jewell C, Naunje A, Mbalume F, Chetwood JD, Nightingale R, Zurba L, Flitz G, Gordon SB, Lesosky M, **Balmes JR**, Mortimer K. Non-communicable respiratory disease and air pollution exposure in Malawi: a prospective cohort study. Thorax. 2020 Mar;75(3):220-226. PMCID: PMC7063402
3. Wilhelm M, Meng YY, Rull RP, English P, **Balmes J**, Ritz B. Environmental public health tracking of childhood asthma using California health interview survey, traffic, and outdoor air pollution data. Environ Health Perspect. 2008 Sep;116(9):1254-60. PMCID: PMC2535631
4. Reid CE, Mann JK, Alfasso R, English PB, King GC, Lincoln RA, Margolis HG, Rubado DJ, Sabato JE, West NL, Woods B, Navarro KM, **Balmes JR**. Evaluation of a heat vulnerability index on abnormally hot days: an environmental public health tracking study. Environ Health Perspect. 2012 May;120(5):715-20. PMCID: PMC3346770

### B. Positions and Honors

1981-1982	Instructor in Medicine, Yale University
1983-1986	Assistant Professor of Medicine, University of Southern California
1986-1992	Assistant Professor of Medicine, University of California, SF
1992-1998	Associate Professor of Medicine, University of California, SF

1998-present	Professor of Medicine, University of California, SF
2002-present	Professor of Environmental Health Sciences, University of California, Berkeley
1992-2014	Chief, Division of Occupational and Environmental Medicine, SF General Hospital
1988-2015	Director, Human Exposure Laboratory, Lung Biology Center, UCSF
2000-present	Director, Northern Calif. Center for Occupational and Environmental Health, UC Berkeley
2014-present	Director, UC Berkeley-UCSF Joint Medical Program
2008-present	Member, California Air Resources Board, Cal/EPA

Pulmonary Academic Award, NHLBI, 1983-1986

Environmental/Occupational Medicine Academic Award, NIEHS, 1991-1996

Clean Air Research Award, American Lung Association of San Francisco and San Mateo, 1997

Clean Air Award, American Lung Association of California, 1999

Jean Spencer Felton Award for Excellence in Scientific Writing, Western Occupational and Environmental Medicine Association, 2002

Robert A. Kehoe Award of Merit, American College of Occupational and Environmental Medicine, 2006

Carl Moyer Award for Scientific Leadership and Technical Excellence, Coalition for Clean Air, 2006

Rutherford T. Johnstone Award for Exemplary Contributions to the Field of Occupational Medicine, Western Occupational and Environmental Medical Association, 2010

Robert M. Zweig Memorial Clean Air Hero Award, South Coast Air Quality Management District, 2012

Public Service Award in Recognition of Outstanding Contributions in Public Health in the area of Respiratory Disease and Medicine, American Thoracic Society, 2016

John M. Peters Award in Appreciation of a Lifetime of Leadership, Research, and Devoted Service to the Pursuit of Respiratory Health, American Thoracic Society Assembly on Environmental, Occupational and Population Health, 2016

Fellow, American Thoracic Society, 2018

Distinguished Achievement Award, American Thoracic Society, 2020

### C. Contributions to Science

#### Controlled human exposure studies to ozone

My group was the first to demonstrate airway inflammation at the tissue level, increased airway inflammation in asthmatic subjects, an enhanced alveolar macrophage response after consecutive days of exposure, and heart rate variability after ozone exposure in experimental studies. These studies have provided important experimental support for the results of epidemiological studies that found associations between ambient ozone and exacerbations of asthma or cardiovascular mortality.

1. Arjomandi M, Witten A, Abbritti E, Reintjes K, Zhai W, Solomon C, **Balmes J**. Repeated exposure to ozone increases alveolar macrophage recruitment into asthmatic airways. Am J Respir Crit Care Med 2005;172:427-432. PMCID: PMC2718526

2. Arjomandi M, Wong H, Donde A, Frelinger J, Dalton S, Ching W, Power K, **Balmes J**. Exposure to medium and high ambient levels of ozone causes adverse systemic inflammatory and cardiac autonomic effects. Am J Physiol Heart Circ Physiol 2015; 308(12):H1499-509. PMCID: PMC446987

3. Arjomandi M, **Balmes JR**, Frampton MW, Bromberg P, Rich DQ, Stark P, Alexis NE, Costantini M, Hollenbeck-Pringle D, Dagincourt N, Hazucha MJ. Respiratory responses to ozone exposure. MOSES (The Multicenter Ozone Study in Older Subjects). Am J Respir Crit Care Med 2018;197:1319-1327. PMID: 29232153.

#### Epidemiological studies of the respiratory health effects of air pollution in children

I have collaborated on multiple research efforts to assess the relationships between exposure to various air pollutants and respiratory outcomes in children and adults. These studies include the growth of lung function, exacerbations of asthma, and incident asthma. The importance of these studies is that they provide evidence that real-world exposure to ambient pollutants is associated with respiratory morbidity.

1. Mortimer KM, Neugebauer R, Lurmann F, **Balmes JR**, Tager IB. The effect of prenatal and lifetime exposure to air pollution on the pulmonary function of asthmatic children. Epidemiology 2008;19:550-557. discussion 561-562.

2. Nadeau K, McDonald-Hyman C, **Noth EM**, Pratt B, Hammond SK, **Balmes J**, Tager I. Ambient air pollution impairs regulatory T-cell function in asthma. J Allergy Clin Immunol 2010;126:845-852. PMID: 20920773

3. Padula AM, **Balmes JR**, Eisen EA, Mann J, **Noth EM**, Lurmann FW, Pratt B, Tager IB, Nadeau K, Hammond SK. Ambient polycyclic aromatic hydrocarbons and pulmonary function in children. J Expo Sci Environ Epidemiol 2015;25:295-302. PMCID: PMC4270934.

4. Neophytou AM, White MJ, Oh SS, Thakur N, Galanter JM, Nishimura KK, Pino-Yanes M, Torgerson DG, Gignoux CR, Eng C, Nguyen EA, Hu D, Mak AC, Kumar R, Seibold MA, Davis A, Farber HJ, Meade K, Avila PC, Serebriskiy D, Lenoir MA, Brigino-Buenaventura E, Rodriguez-Cintron W, Bibbins-Domingo K, Thyne SM, Williams LK, Sen S, Gilliland FD, Gauderman WJ, Rodriguez-Santana JR, Lurmann F, **Balmes JR**, Eisen EA, Burchard EG. Air pollution and lung function

in minority youth with asthma in the GALA II & SAGE II studies. Am J Respir Crit Care Med 2016;193(11):1271-1280.  
PMCID: PMC4910900.

#### Epidemiological and experimental studies of health effects of secondhand tobacco smoke

I have collaborated on the first studies to show acute cardiovascular effects of exposure to secondhand tobacco smoke (SHS). In addition, I have collaborated on several epidemiological studies of the impact of chronic exposures to SHS on COPD and cardiovascular mortality. The importance of the experimental studies is that they provide mechanistic evidence in support of the epidemiological data which demonstrate increased risk of COPD and cardiovascular mortality with exposure to SHS. Together this work supports legislative efforts to ban smoking in public places.

1. Eisner MD, Wang Y, Haight TJ, **Balmes J**, Hammond K, Tager IB. Secondhand smoke exposure, pulmonary function, and cardiovascular mortality. Ann Epidemiol 2007;17:364-373.
2. Heiss C, Amabile N, Lee AC, Real WM, Schick SF, Lao D, Wong ML, Sarah Jahn S, Angeli FS, Minasi P, Springer ML, Hammond SK, Glantz SA, Grossman W, **Balmes JR**, Yeghiazarians Y. Brief secondhand smoke exposure depresses EPC activity and endothelial function: sustained vascular injury and blunted NO production. J Am Coll Cardiol 2008;51:1760-1771.
3. Frey PF, Ganz P, Hsue PY, Benowitz NL, Glantz SA, **Balmes JR**, Schick SF. The exposure-dependent effects of aged secondhand smoke on endothelial function. J Am Coll Cardiol 2012; 59:1908-1913.

#### Epidemiological studies of the contribution of occupational exposures to the burden of COPD

I have collaborated on some of the key studies that have documented that 15-20% of the population attributable risk of chronic obstructive pulmonary disease is due to occupational exposures. This research is important because it identified the relative contribution of a preventable factor to a leading cause of death and disability world-wide.

1. Trupin L, Earnest G, San Pedro M, **Balmes JR**, Eisner MD, Yelin E, Katz PP, Blanc PD. The occupational burden of chronic obstructive pulmonary disease. Eur Respir J 2003; 22: 462-469.
2. Blanc P, Iribarren C, Trupin L, Earnest G, Katz P, **Balmes J**, Sidney S, Eisner M. Occupational exposures and the risk of COPD: dusty trades revisited. Thorax 2009;64:6-12. PMCID: PMC2775075

#### Epidemiological studies of adverse effects of household air pollution

I have collaborated on the first randomized controlled trial of a chimney stove for the prevention of early childhood pneumonia, written the grant that funded follow-up of the children's health later in childhood, and led several studies of adult respiratory outcomes. Household air pollution (HAP) is the leading environmental factor and 3<sup>rd</sup> most important factor overall contributing to the global burden of disease. This work has provided key data toward documenting the public health impact of this preventable environmental hazard.

1. Smith KR, McCracken JP, Weber MW, Hubbard A, Jenny A, Thompson LM, **Balmes J**, Diaz A, Arana B, Bruce N. Effect of reduction in household air pollution on childhood pneumonia in Guatemala (RESPIRE): a randomised controlled trial. Lancet 2011 Nov 12; 378(9804):1717-26.
2. Guarnieri MJ, Diaz JV, Basu C, Diaz A, Pope D, Smith KR, Smith-Sivertsen T, Bruce N, Solomon C, McCracken J, **Balmes JR**. Effects of woodsmoke exposure on airway inflammation in rural Guatemalan women. PLoS One 2014;9:e88455. PMCID: PMC3953023
3. Heinzerling AP, Guarnieri MJ, Mann JK, Diaz JV, Thompson LM, Diaz A, Bruce NG, Smith KR, **Balmes JR**. Lung function in woodsmoke-exposed Guatemalan children following a chimney stove intervention. Thorax 2016;71:421-428. PMID: 26966237.
4. \*Mortimer K, Ndamala CB, Naunje A, Malava J, Katundu C, Weston W, Havens D, Pope D, Bruce N G, Nyirenda M, Wang D, Crampin A, Grigg J, **Balmes J**, Gordon S. A cleaner burning biomass-fueled cookstove intervention to prevent pneumonia in children under 5 years old in rural Malawi (CAPS): a cluster randomized controlled trial. Lancet 2016;389(10065):167–175. PMID: 27939058 PMCID: PMC5783287

\*Best Environmental Epidemiology Paper of the Year Award – International Society for Environmental Epidemiology

#### **Complete List of Published Work in MyBibliography:**

<http://www.ncbi.nlm.nih.gov/pubmed/?term=balmes+>

#### **D. Additional Information: Research Support and/or Scholastic Performance**

##### Ongoing Research Support

NIEHS R01ES029995 (Co-PIs: Clark, Volckens -- Colorado State Univ.; Balmes, Co-I) 11/1/2019-6/30/2024

Sustainable Household Energy Adoption in Rwanda [SHEAR]: Promoting Rural Health with Solar and Gas  
The goal of this project is to conduct a randomized controlled trial of a combined clean cooking (LPG) and clean lighting (solar) household intervention to improve lung function and blood pressure.

NIEHS 1 R24 ES030888-01 (MPIs: Balmes, Holland, Noth)

2/15/2020-2/14/2025

**CHAPS Cohort Maintenance**

The major goal of this project is to continue longitudinal follow-up of the participants in the Children's Health and Air Pollution Study (CHAPS), an epidemiological study that has focused on the effects of air pollution on children growing up in the San Joaquin Valley of California, one of the most polluted areas in the country.

NIEHS 1 R21 ES030173-01A1 (Balmes)

4/01/2020-12/31/2021

AIMS to Improve Asthma: Airflow Improvements during Meal-prep in Richmond, CA

The major goal of this project is to study whether stove ventilation will reduce indoor fine particulate matter and improve asthma outcomes in a disadvantaged community.

**Recently Completed Research Support**

NIEHS/EPA P01 ES022849/83543501 (MPIs: Hammond, Shaw, Balmes)

7/17/2013-6/30/2019

UC Berkeley/Stanford Children's Environmental Health Center

This center is composed of four research projects examining the role of air pollution, especially ambient PAHs, on children's health, specifically in birth defects and prematurity, immunity and atopy mechanisms, obesity and glucose dysregulation.

Role: Multiple Principal Investigator

Enterprise Community Partners, Inc. 14-8623 (Balmes)

5/1/2014-4/30/2019

Healthy Homes, Healthy Kids

The major goal of this project is to study whether green renovation of public housing will improve asthma outcomes in children with asthma from disadvantaged families.

Role: Principal Investigator

NIEHS ES124362 (PI: Peel, Colorado State University)

7/1/2014-6/30/2019

Cookstove air pollution: emission profiles and subclinical effects of exposure

The major goal of this project is to perform subclinical cardiovascular and pulmonary tests of human volunteers exposed to emissions produced by several different cookstoves under controlled conditions.

Role: Co-investigator

Health Effects Institute (Balmes)

7/1/2011-6/30/2018

Multi-center Ozone Study in Elderly Subjects (MOSES)

The major goal of this project is to conduct controlled exposure studies of low levels of ozone to assess the risk of acute cardiovascular effects in older adults.

Role: Principal Investigator, UCSF site

NIEHS R56ES023566 (Balmes)

9/1/2014-8/31/2016

Cluster Randomized Controlled Trial of an Advanced Stove to Reduce Risk of COPD

The major goal is to study the efficacy of a relatively clean-burning biomass cook stove on respiratory symptoms and lung function in a cohort of women in multiple villages in rural Malawi.

Role: Principal Investigator